

reaching hurricane force. Typical storm logs are as follows:

American S. S. *Imlay*, Capt. H. Warrer, Shanghai (Mar. 10) for San Francisco; observer, T. Olson. Gale began on the 13th; lowest barometer, 29.45 inches, at 3 p. m. of the 14th in latitude 37° 25' N., longitude 145° E.; highest force of wind and direction, 10, W.; gale ended on the 18th; shifts, NW. to W.

British S. S. *Tachee*, Capt. I. D. Llewellyn, San Francisco (Mar. 1) for Hongkong; observer, T. Gore, third officer. Gale began and ended on 15th; lowest barometer, 29.57 inches, at 7.45 a. m., in latitude 33° 34' W., longitude 144° 06' E.; highest force of wind and direction, 10, W.; shifts, SW.-W.-WNW.-NW.

The *Tachee* also experienced heavy weather on the 13th and 14th.

The Japanese S. S. *Mexico Maru*, Capt. N. Yanagi, Los Angeles for Yokohama (Mar. 15), came under the influence of this depression on the 12th, being at Greenwich Mean Noon of that date in latitude 34° 35' N., longitude 147° 23' E. On this date there was a moderate SSE. gale and high sea, causing the vessel to labor heavily and ship water both fore and aft. The sea continued rough on the 13th with a long southwesterly swell. On the 14th there was a strong westerly gale with very high sea.

This depression apparently moved in the direction of Bering Sea as according to reports at hand it did not noticeably affect shipping east of the 165th meridian, east longitude.

About the 25th another depression of considerable intensity developed to the east of Japan, involving a number of vessels in the western part of the steamer lanes. The following storm logs show the character of this depression:

American S. S. *Montague*, Capt. G. H. Whitehead, Observer F. R. Gillan, second officer, Columbia River (Mar. 13) for Yokohama. Gale began on 26th, wind SE., 8; lowest barometer 28.20 inches (uncorrected), at 10 a. m. of 27th, in latitude 44° N., longitude 157° 20' E.; gale ended on 27th, wind NW. by W.; highest force and direction, 11, SW.; shifts, SE.-SW.-WNW.

The *Montague* had previously experienced gales on the 19th, in longitude 174° W.; on the 20th, in longitude 178° 45' W.; and early on the 23d, in longitude 174° 45' E. In the afternoon of the 23d the wind increased to a strong gale. Following the storm of the 27th another storm was encountered on the 29th, in longitude 149° 50' E. The barometer fell to 28.68 (uncorrected) at 10 a. m. of

that date and the wind attained force 11, NW. by W. In the storm of the 26th-27th the barometer fell at the rate of 0.15 inch an hour and rose at the rate of 0.15 to 0.20 inch an hour.

Japanese S. S. *Africa Maru*, Capt. M. Ohyama, observer, second officer, S. Kichuchi, Yokohama (Mar. 24) for Victoria. Gale began 26th, wind ESE.; lowest barometer 28.65 inches at 10.36 p. m. of 27th in latitude 44° 21' N., longitude 159° 45' E.; highest force of wind and direction, 11, W., end of gale on 31st, wind W.; shifts of wind, 6 points.

On the 16th and 17th the Norwegian M. S. *Theodore Roosevelt*, Capt. Eric Thomle, Astoria (Mar. 4) for Panama, experienced a strong gale accompanied by a high sea off the Central American coast. According to Observer Sverre Sandahl, the gale began at ENE.; lowest barometer 29.96 inches at 5 a. m. of 17th in latitude 10° 50' N., longitude 86° 45' W.; highest force and direction, 10, WSW.

A report for March that possesses unusual interest is that of the Dutch S. S. *Baarn*, Capt. J. van Rijnbach, Valparaiso for Punta Arenas, thence toward Boston. Observer J. J. Ch. de Lange states that on March 14, before entering the strait, the weather was rainy with fresh to strong NW. breeze and some hail. When passing through the strait on the 15th there was a moderate NW. gale, with heavy rain and hail. Many tide rips were observed. The *Baarn* left Punta Arenas on the 29th with rainy weather. More tide rips were observed. On the 30th the weather was stormy, with a wild sea; wind NNW., force 9. The weather continued stormy until April 4.

During the voyage of the American S. S. *Northwestern*, Capt. Wm. Jensen, from Seattle to southwestern Alaskan ports and return, March 12-24, an exceptionally large display of northern lights was seen nearly every night while in Alaskan waters. Observer P. Christiansen states that these were probably due to the long period of clear and cold weather. This in turn may be associated with the continuously high pressure at Dutch Harbor, previously mentioned.

On March 1, at 9.45 p. m. in latitude 5° 34' S., longitude 81° 30' W., a large meteor was observed from the American M. S. *Sierra*, Capt. Olaf A. Janson, San Francisco for Callao. Observer John Behrsin states that its brightness surpassed that of the moon.

## NOTES ON WEATHER IN OTHER PARTS OF THE WORLD.

**Newfoundland.**—The Newfoundland sealing fleet which went out on the 10th was unable to find the herds, owing to heavy ice.<sup>1</sup>

**British Isles and western Europe.**—As in the two preceding months, there was a marked absence of severe wintry weather over western Europe generally, and even in Sweden there was little frost after the 9th. Brief incursions of polar air were accompanied by snow in the northern districts of the British Isles at times in the first week, and in the western districts on the night of the 28th, but milder weather followed at once in every case.<sup>1</sup>

**British Isles.**—The general rainfall expressed as a percentage of the average was: England and Wales, 101; Scotland, 170; Ireland, 129; \* \* \*.

In London (Camden Square) the mean temperature was 46.8° F., or 4.6° F. above the average. \* \* \*

**France.**—Paris, March 10.—All eastern and southern France is beginning to suffer from very unusual drought for this time of the year. Since the middle of January very little rain has fallen, even in the mountain districts. \* \* \*

The result has been that the rivers are lower than at any time for 20 years at this season, and are fast approaching the lowest summer record. \* \* \* In some parts of France authorities have had to post notices urging economy of water, as many wells have gone dry. \* \* \*—*New York Times*, March 11, 1921.

**Switzerland.**—Paris, March 15.—The extraordinary drought which is causing grave damage to French farmers has also brought heavy loss to the winter sports industry in Switzerland. The bright sunshine has melted the snow at St. Moritz and other resorts until it is now necessary to mount to an altitude of 4,500 feet to find slides. \* \* \*

Lake Geneva has almost gone dry [?] \* \* \* Not for 90 years has it been so dry in Switzerland. Cities which depend upon hydraulic production of electricity have had to ration themselves.—*New York Times*, March 16, 1921.

**India.**—A telegram dated March 18 stated that famine had been declared in parts of the Bellary and Anantapur districts of the Madras Presidency.<sup>1</sup>

**Hawaii.**—Honolulu, April 16.—All islands during the month of March experienced subnormal precipitation,

<sup>1</sup> *The Meteorological Magazine*, April, 1921, pp. 77, 79, and 84.

with the greatest deficiency over Kauai and Oahu \* \* \*. The means for the groups was 4.52 inches, against a 17-year mean of 7.81 inches, or only 58 per cent of the territorial 17-year mean \* \* \*.

The mean temperature for the section exceeded the March normal over all islands of the territory, being 69.7 degrees, against a 17-year mean of 68.7 degrees. \* \* \*—*Honolulu Times*, Apr. 16, 1921.

*Peru.*—The year 1920 was remarkable for its unusual rainfall. Not only was the curve for the depth of the Amazon at Iquitos higher throughout April and May than for many years, but also throughout the dry season. The lowest stage reached was some 7 feet higher than the mean minimum depth.

The exceptional inundation of April and May had destroyed much of the crops. There was a serious

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## DETAILS OF THE WEATHER OF THE MONTH OF THE UNITED STATES.

### CYCLONES AND ANTICYCLONES.

By W. P. DAY, OBSERVER.

Lows were much above the normal in number and well distributed by type. Secondary developments were numerous, particularly of the Colorado and Texas types.

HIGHS were also in excess of the average, but about normal as to type. However, five of the Alberta HIGHS moved far to the north of the normal path and their effect was only marked along the northern border. Of the remaining two, the HIGH of the 27-30th, produced the only general cold wave.

Tables showing the number of HIGHS and LOWS by types follow:

#### Lows.

	Al- berta.	North Pa- cific.	South Pa- cific.	North- ern Rocky Moun- tain.	Colo- rado.	Texas.	East Gulf.	South At- lantic.	Central.	Total.
March, 1921.....	6.0	2.0	1.0	1.0	5.0	3.0	1.0	.....	2.0	21.0
Average number, 1892-1912, in- clusive.....	3.6	2.1	1.1	0.3	1.9	1.3	0.4	0.3	0.7	11.8

#### Higs.

	North Pacific.	South Pacific.	Al- berta.	Plateau and Rocky Moun- tain region.	Hudson Bay.	Total.
March, 1921.....	2.0	1.0	7.0	1.0	1.0	12.0
Average number, 1892-1912, inclusive	0.9	0.7	5.6	0.9	0.5	8.5

### THE WEATHER ELEMENTS.

By P. C. DAY, Climatologist and Chief of Division.

[Weather Bureau, Washington, D. C., May 2, 1921.]

#### PRESSURE AND WINDS.

The absence of frequent and strong pressure variations that characterized the weather during much of the past winter persisted to an unusual extent during the first spring month. As a result the weather of March, 1921, lacked much of the blustery and changeable character so commonly attributed to that month, and in many portions of the country it took on the character of the mid-spring season.

shortage of all staples (plaintains, beans, yucca, rice, etc.) and considerable hardship among the improvident. At no time were the sand bars of the Marañon or Amazon exposed. This of course affected the fishing industry. Seining was made much more difficult, while throw-net fishing was probably increased, due to the concentration of the mijanos, schools of fish.—*W. R. Allen in Science*, Apr. 22, 1921, p. 378.

*Australia.*—At the beginning of the month torrential rains fell in South Australia, causing such serious floods that ports had to be closed and traffic on the Transcontinental Railway suspended. At the same time good rain fell throughout practically the whole of New South Wales. A message received on the 17th stated that heavy rain had put out the fires in South Gippsland (Victoria).<sup>1</sup>

An examination of the charts showing the average sea-level pressure and its departure from the normal discloses, as during several months preceding, a preponderance of pressure over southern districts and a consequent flow of air from southerly into northerly regions. Likewise a review of the daily weather charts shows a marked absence of strong projections from the Polar Front, and few of the HIGHS entering the northern boundaries of the United States penetrated extensively into the interior portions.

About the end of the first decade pressure had increased greatly in Alaska and the Canadian Northwest Provinces, and indications pointed to an extensive invasion of cold weather into the Northwest and interior districts of the United States. The full development of this high-pressure area was apparently obstructed by the appearance of cloudy, rainy weather in the central valleys, and it passed eastward over the more northern districts with only moderate decreases in temperature.

About the end of the second decade another high-pressure area of considerable magnitude entered the northwestern districts, and, while its influence extended farther southward into the Great Plains than that of the preceding decade, its extension eastward was likewise retarded by the development of cloudy, rainy weather, and it, too, passed along the northern border without large temperature changes, save over the more northern districts.

A third invasion of cold from the Polar Front occurred near the end of the last decade, and coming later in the month and after a long period of unusual warmth was, in a comparative way the severest of the month over the greater part of the country east of the Rocky Mountains, and actually so in the Mississippi and Ohio Valleys and portions of adjacent regions. This high pressure area first appeared in the Canadian Northwest on the morning of the 26th and by the following morning it had advanced into the upper Missouri Valley, and sharp changes to colder weather had occurred over the Great Plains as far south as the Texas Panhandle. During the following 24 hours the center of highest pressure moved to the lower Missouri Valley and the lowest temperatures of the month prevailed from central Texas and the lower Mississippi Valley northward to the Canadian border, with indications that during the following 24 hours it would advance farther southward and the attending cold seriously threaten the great early-fruit and vegetable districts of the South, where the continued warm weather had advanced vegetation far ahead of the usual condition so early in the spring. This was not fully accomplished, however, as the center of high pressure changed its course to the northeastward.